

TRANSISTORIZED PHOTOELECTRIC CONTROL



PHOTOELECTRIC CONVEYOR CONTROLS

- All silicon transistors — No warm-up needed.
- Plug-in power relay for easy maintenance.
- 8-foot pre-wired leads for easy installation.
- Maximum ambient temperature range: 140°F.
- Printed circuit on laminated fiberglass.
- NEMA 12 construction.
- Up to 2,000 operations per minute.
- 15-foot scanning distance.
- Instantaneous and delayed-action models, up to 12 seconds delay.

The TR-1 series of photoelectric scanning systems has been designed to provide compact, reliable, easy-to-install systems for use on conveyors and production equipment where objects are large enough to completely block the light beam.



LS-4

TR-1
TR-1L
TR-1D

TYPE TR-1 RELAY:

The TR-1 Relay is an on-off control in which the relay is de-energized by blocking the light beam (light-operated). Two sets of single-pole, double-throw relay contacts are wired in series to give a conservative 5-ampere (non-inductive) load-rating with single-pole, double-throw, double-break action. A compact plug-in relay, locked in the socket, makes servicing easy. Elevated temperature stability up to 140°F is possible due to the selection of all silicon transistors. The photocell input is voltage-regulated and temperature-compensated to ensure reliable operation under adverse conditions.

The printed-circuit board is made of laminated fiberglass. All components should have indefinite life

because of conservative rating and use of a hermetically-sealed photocell. All entrances to the steel relay enclosure are sealed by neoprene gaskets under pressure so that the control is sealed against external moisture.

Color-coded No. 18 leads, 8 feet long, simplify installation directly in conduit. The control leads are generally wired to a nearby junction box but from there they may be extended to as much as 100 feet without affecting operation. The color code is clearly stamped on the relay frame so that connections may be checked by removing relay cover in the event installation instructions are lost.

TYPE LS-4 LIGHT SOURCE:

The LS-4 Light Source exactly matches the TR-1 relay in physical size. It contains a step-down transformer so that it may be connected directly to a 115-volt 50/60 cycle line by the 8-foot leads. It is unnecessary to open the unit during installation.

The lamp has been pre-set at the factory for

optimum focus; operating at reduced voltage, its life should exceed 10,000 hours. Scanning distances up to 15 feet can be obtained under normal factory lighting. When a lamp change is required, there is an easy locking adjustment that permits refocusing of the new lamp.

FARMER ELECTRIC PRODUCTS COMPANY, INC.

TECH CIRCLE, NATICK, MASSACHUSETTS

AREA CODE 617, 653-8850

TRANSISTORIZED PHOTOELECTRIC CONTROL

TYPE TR-1D RELAY:

The TR-1D Relay is similar in size and construction to the TR-1 except that the relay is prevented from operation until the light beam has been interrupted for a pre-selected time (dark-operated). The time-delay is adjustable from $\frac{1}{2}$ to 12 seconds by a precision potentiometer that is reached by removing the relay cover. Less than 2% time-delay variation is observed with line-voltage change from 90 to 130 volts.

The TR-1D Relay is used where jam-up protection is required on conveyors or production equipment. Normal flow of material or parts will not energize the relay. In the event that the light beam is interrupted for more than the pre-selected time-delay, the relay will operate to sound an alarm or shut off the equipment. The plug-in relay is identical to that in the TR-1 control.

TYPE TR-1L RELAY:

The TR-1L Relay is similar in performance to the TR-1D except that the time-delay is started by light shining on the photocell (light-operated) instead of by light interruption. This control is designed specifically to detect failure of parts to pass the scanning point. Normal flow of parts does not operate the control relay, but if parts fail to interrupt the beam for more than the pre-selected time delay, the relay will operate to sound an alarm or shut off the equipment.

SPECIFICATIONS

Power supply: Control and light source 100 to 130 volts, 50/60 cycle.

Power consumption: Relay unit TR-1, TR-1L, TR-1D — 4.5 watts maximum.

Light source LS-4: 7 watts maximum.

Installation: Mount on $\frac{1}{2}$ " iron pipe; optional support with mounting bracket MB-1.

Relay contacts: SPDT double-break 5 amperes 115 volts a-c, non-inductive (isolated from control circuit).

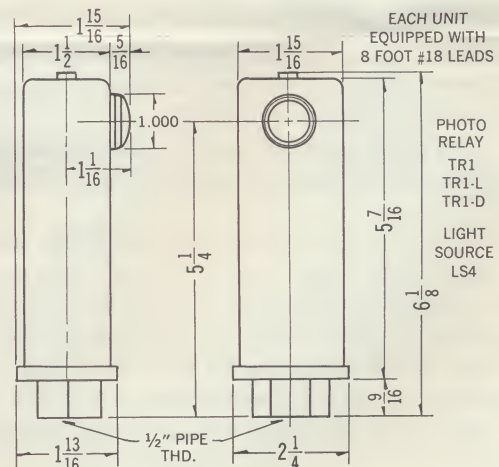
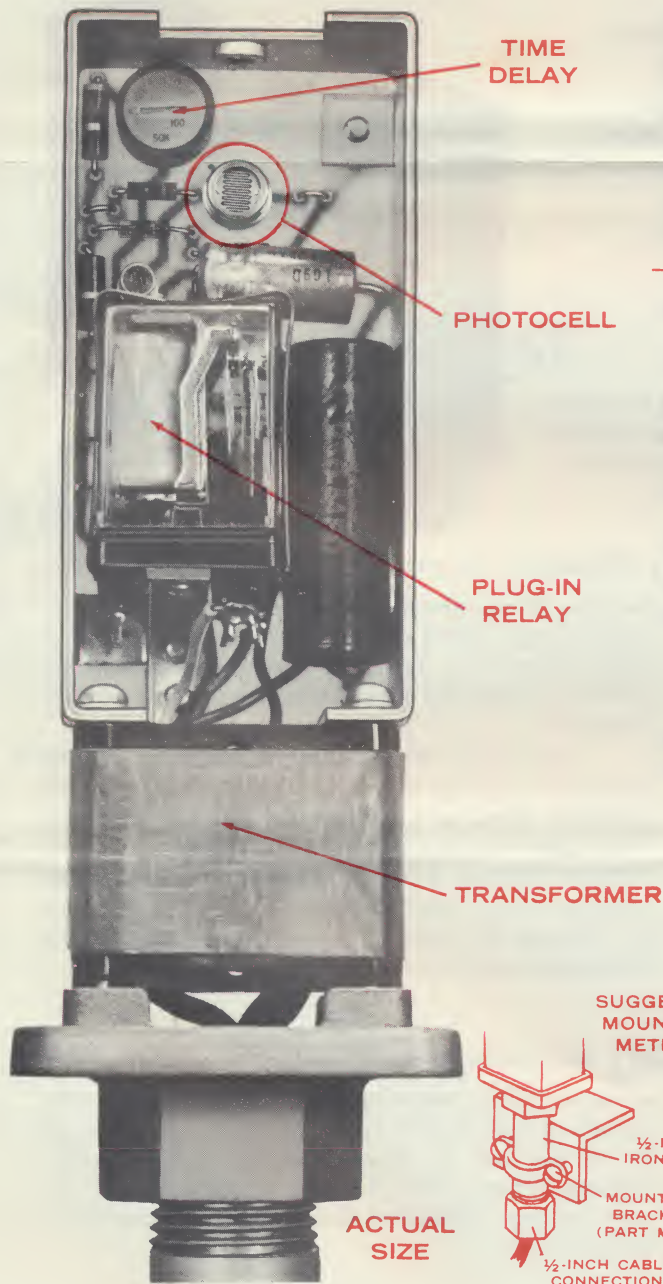
Maximum operating speed of TR-1: 2,000 operations per minute.

Maximum time delay of TR-1D and TR-1L: 12 seconds.

Minimum time delay: $\frac{1}{2}$ second. Reset time — 50 milliseconds. This is time required for light to shine on the cell for TR-1D (dark-operated), or for the light to be interrupted on TR-1L (light-operated), to insure full time-delay.

Maximum ambient temperature: 140°F.

Shipping weight per system (including LS-4, and TR-1, TR-1D, or TR-1L): 6 pounds.



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3 units in 1

US Patent applied for

TYPE TR CHASSIS

- One common chassis with three independent plug-in logic modules.
- 1. General-purpose — up to 2000 operations per minute.
- 2. Adjustable pulse output — responds to fast or slow-moving objects.
- 3. Time delay — $\frac{1}{2}$ to 12 seconds.
- All silicon transistors — no warm-up needed.
- Remote scanning heads with 8-foot leads.
- DPDT 8-ampere, plug-in relay.
- Maximum ambient temperature range: 140°F.
- Top-mounted light-and-dark changeover switch.

With emphasis on control-flexibility and simplicity, one common chassis, with power supply and plug-in relay, is available for three different interchangeable plug-in logic modules. By inserting any one of the three logic modules, the same photoelectric scanner relay can be used for general counting operations, high-speed registration-control, or jam-up protection for moving conveyor lines.

All relays have a light-or-dark-operation changeover switch mounted on each module. Each chassis has provision for immobilizing the relay coil by an external switch. Low voltage is supplied to two terminals, for operating the remote light-sources. For stability at elevated temperatures, up to 140°F, silicon transistors have been selected and mounted on a laminated fiberglass printed-circuit board. The photocell input is voltage-regulated and temperature-compensated to ensure reliable operation under adverse conditions.

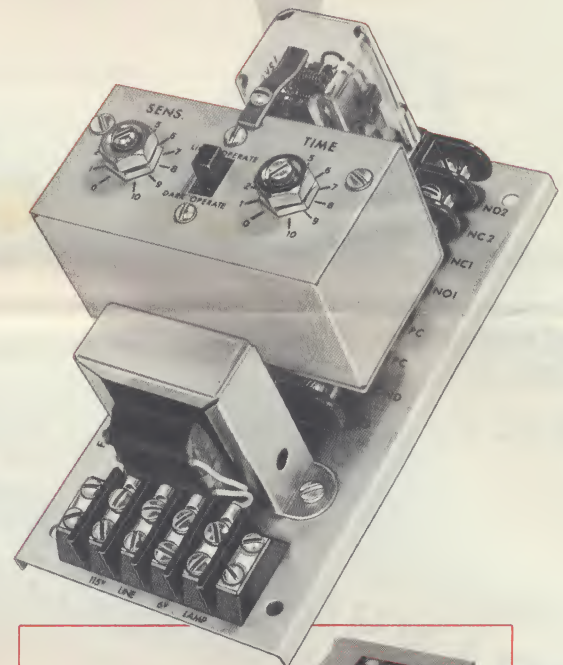
Two sets of SPDT relay contacts are connected to six terminals for control switching. Relay contacts are rated at 8 amperes, 115 volts a-c, non-inductive. All units are available with or without a 10" x 6" x 4 $\frac{3}{4}$ " gray hammertone NEMA 1 steel housing with locking hasp.

Any of the three logic modules are available separately, without the common chassis and plug-in relay, for use with customers' 15-volt a-c power supply. This allows control fabricators to use multiple photoelectric logic systems in a minimum of space, with one common 15-volt a-c power supply.

TYPE TR-3 RELAY:

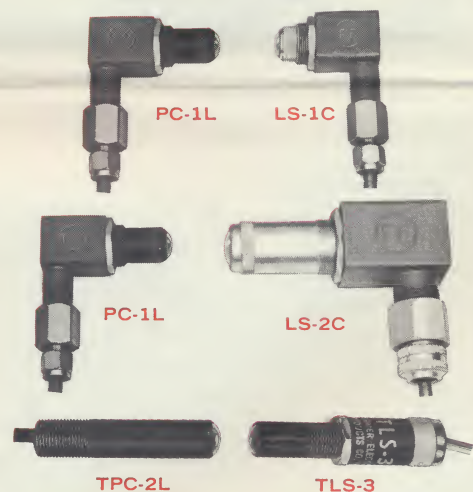
The TR-3 relay is an on-off control that responds instantaneously to changes of light or dark. This unit is capable of operating up to 2,000 times per minute. Minimum light interruption required is 20 milliseconds.

On special order, the TR-3 relay is available with relay lock-in that is resettable by an external normally-open switch.



CASE
10" x 6" x 4 $\frac{3}{4}$ "

REMOTE SCANNING HEADS



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TYPE TR-4 RELAY:

The TR-4 is a highly sensitive scanner relay containing a pulse stretching circuit that enables the relay to respond to light interruptions of two milliseconds, depending on signal. It holds the relay in for a dwell time adjustable up to approximately 0.1 second. Unlike other pulse-operated devices, the Type TR-4 relay operates on objects moving either very rapidly or extremely slowly. Applications for

this high-speed impulse-relay include detecting registration marks, counting fast-moving, small objects, or counting fast-moving large objects with a small space between them. Dark operation will energize the relay on the leading edge of an object. When set for light operation, relay will pulse on trailing edge of object.

TYPE TR-5 RELAY:

The TR-5 scanner relay is designed for jam-up protection for conveyors or production equipment. Normal flow of material or parts will not energize the relay but, should the light beam be interrupted (or not interrupted) for more than the pre-selected time

delay, the relay will operate to sound an alarm or shut off the equipment. The time adjustment, mounted on the plug-in module, varies the delay from 0.5 to 12 seconds. Less than 2% time-delay variation occurs with line-voltage change from 90 to 130 volts.

SPECIFICATIONS — All units

Power supply: 100 to 130 volts, 50/60 cycles.

Power consumption: All units with LS-1C or TLS-3 light source: 5 watts; with LS-2C light source: 11 watts.

Maximum speed, TR-3: 2,000 operations per minute.

Minimum light interruption TR-4: two milliseconds, depending on signal.

Time-delay range, TR-5: 1/2 to 12 seconds.

Reset time, TR-5: 50 milliseconds; this is time required for light to shine on the photocell (dark-operated) or for the light to be interrupted (light-operated) to insure full time-delay.

Choice of Model

The scanning range (distance between the light-source and photocell) governs the choice of system elements. Three sets of scanning assemblies cover distances up to 20 feet.

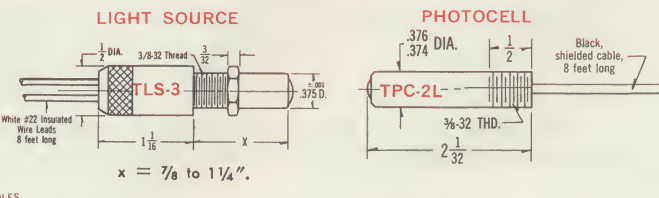
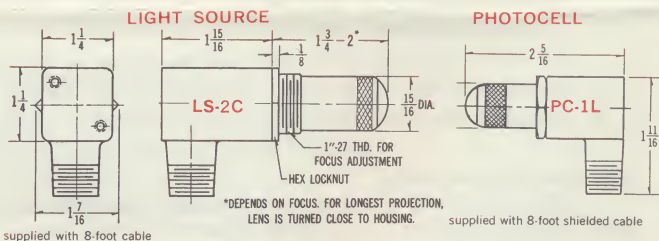
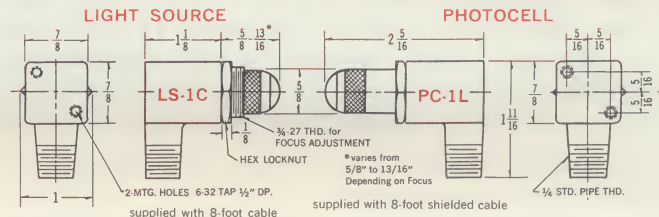
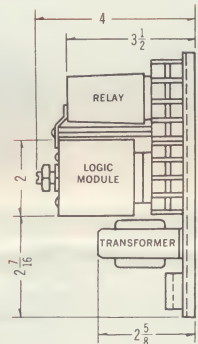
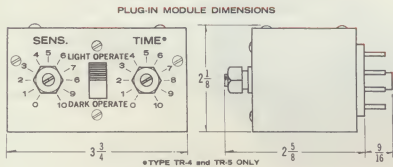
Maximum ambient temperature: 140°F for all units.

Relay contacts: Double-pole, double-throw 8 amperes 115 volts a-c, non-inductive. Relay is plastic-enclosed plug-in type.

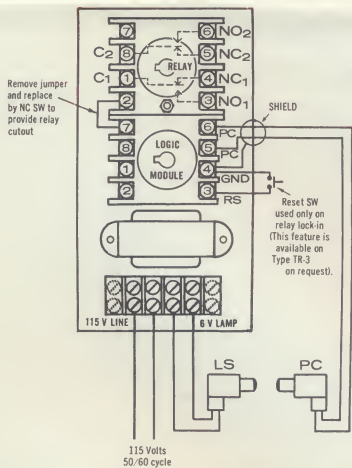
Shipping weight for the complete unit: 12 lbs including NEMA 1 housing; 6 lbs without NEMA 1 housing.

All units are supplied with remote scanning assemblies with 8-foot leads. All photocell receivers have shielded cables.

Scanner relay	Suffix	Scanning assembly included Light-source	Photocell	Scanning distance maximum
TR-3	A	LS-1C	PC-1L	4 Feet
TR-4	AM	LS-2C	PC-1L	20 Feet
TR-5	AT	TLS-3	TPC-2L	3 Feet



RELAY WIRING DIAGRAM



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Model TR-1500 PHOTOELECTRIC COUNTER

- **No relays** — silicon transistors operate 6-digit counter directly.
- **Plug-in counter.**
- **Plug-in circuitry.**
- **1500 operations per minute at temperatures up to 140°F.**
- **Remote scanning heads.**

Model TR-1500 is a 6-digit photoelectric counter that requires no relays. Silicon-transistor circuitry operates the coil of the counter directly. Further simplicity is obtained by utilizing plug-in counter and logic circuitry. The counter operates on either light or dark impulses by means of a simple changeover switch located on top of the plug-in circuit module. The counter can be manually reset by a pushbutton, even during counting operations, without damage to the operating mechanism.

Any remote scanning assembly may be used as described on Page 4. Low voltage is supplied to two terminals for operating the remote light-source. The unit is made stable at temperatures up to 140°F by use of silicon transistors mounted on a laminated fiberglass printed-circuit board. The photocell input is voltage-regulated and temperature-compensated to ensure reliable operation under adverse conditions.

The Model TR-1500 (enclosed) includes a 10" x 6" x 4¾" gray hammertone NEMA 1 steel housing with locking hasp and viewing window. The Model TR-1500 (open style) is supplied without housing, for easy mounting on control panels.

SPECIFICATIONS:

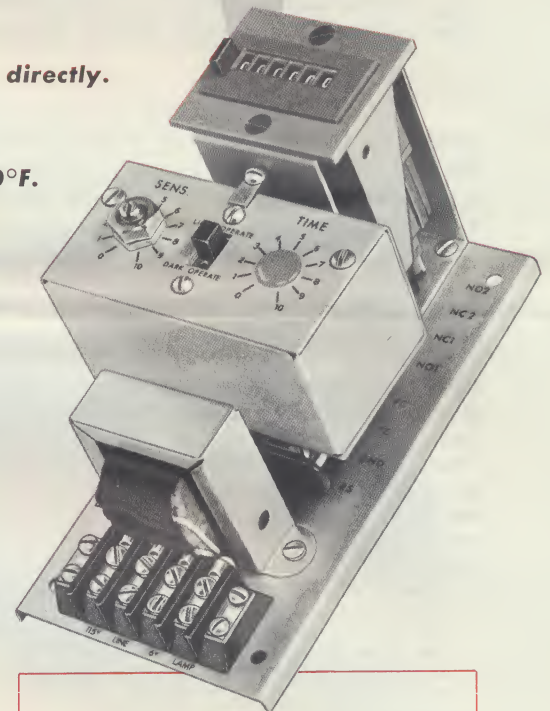
- **Power supply:** 100 to 130 volts, 50/60 cycle.
- **Power consumption:**
All units with LS-1C or TLS-3 light source: 8.5 watts.
All units with LS-2C light source: 14.5 watts.
- **Maximum speed:** 1,500 operations per minute.
- **Minimum light or dark interruption time:** 10 milliseconds.
- **Mechanical life of counter:** 100-million operations.
- **Shipping weight:** Model TR-1500 (enclosed): 12 lbs.
Model TR-1500 (open style): 6 lbs.

Ordering instructions:

The Model TR-1500 does not include remote scanning assemblies. These scanners are ordered separately from those described on Page 4.

Scanning-distance maximum	Light-source	Photocell
4 feet	LS-1C	PC-1L
20 feet	LS-2C	PC-1L
3 feet	TLS-3	TPC-2L

For other Farmer Electric photoelectric controls, electronic timers and Rototimers, write for Product Catalog A.

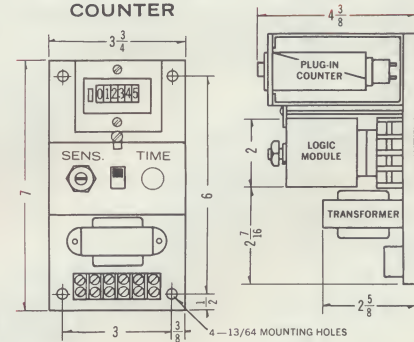


CASE



10" x 6" x 4¾"
with window

DIMENSION DIAGRAM
MODEL TR-1500
COUNTER



FARMER ELECTRIC PRODUCTS COMPANY, INC.

TECH CIRCLE, NATICK, MASSACHUSETTS

AREA CODE 617. 653-8850

photoelectric relays
FARMER ELECTRIC PRODUCTS CO.

Tech Circle, Natick, Massachusetts 01762

TRANSISTORIZED
PHOTOELECTRIC CONTROLS

AUTOMATION COMPONENTS
Photoelectric Scanners
CK Electronic Timers
Synchronous Conductors



MR. T. NELSON
INTERLOCKING SYS. CO.
BOX 1546
POUGHKEEPSIE, NEW YORK 12603

FIRST CLASS MAIL

FARMER ELECTRIC PRODUCTS Company, Inc.

TECH CIRCLE, NATICK, MASSACHUSETTS



Number 6 - T

Effective

June

1964

PRICE LIST

TRANSISTORIZED PHOTOELECTRIC CONTROLS

SCANNER RELAYS — Remote Scanning Assemblies

	Scanner Relay	Scanning Assembly Includes		List Price of Complete System	
		Light Source	Photocell	Enclosed*	Open
GENERAL- PURPOSE RELAYS	TR-3A	LS-1C	PC-1L	\$ 99.60	\$ 89.60
	TR-3AM	LS-2C	PC-1L	105.80	95.80
	TR-3AT	TLS-S	TPC-2L	98.50	88.50
	TR-3	Plug-in module only.....		37.00	
HIGH-SPEED IMPULSE RELAYS	TR-4A	LS-1C	PC-1L	122.60	112.60
	TR-4AM	LS-2C	PC-1L	128.80	118.80
	TR-4AT	TLS-3	TPC-2L	121.50	111.50
	TR-4	Plug-in module only.....		60.00	
TIME-DELAY RELAYS	TR-5A	LS-1C	PC-1L	111.60	101.60
	TR-5AM	LS-2C	PC-1L	117.80	107.80
	TR-5AT	TLS-3	TPC-2L	110.50	100.50
	TR-5	Plug-in module only.....		49.00	

TR chassis complete without plug-in
module or scanners (Applies to all units above) 41.00 31.00

*10 x 6 x 4 3/4" NEMA 1 steel housing with latching cover.

PHOTOELECTRIC COUNTERS

TR-1500 Less Scanners (Any light source or photocell may
be selected from "Scanning Heads and Accessories") 133.00 118.00

Discount Schedule

Quantity	Discount	
1-4	List	Applies to all purchasers who use the equipment in their own plant. Manufacturers of OEM equipment for resale are invited to write for OEM discounts.
5-9	5%	
10-24	10%	
25-49	15%	
50 up	Write for quotation	

CONVEYOR CONTROLS

	List Price
TR-1 General Purpose	\$63.00
TR-1D Time Delay — Dark Operation	84.00
TR-1L Time Delay — Light Operation	84.00
LS-4 Matching Light Source for above units	23.00

SCANNING HEADS AND ACCESSORIES

LS-1C Light-source with #12 Bulb and 8 foot cable	\$ 8.80
LS-2C Extended-range light-source with #210 Bulb and 8 foot cable	15.00
TLS-3 Tubular adjustable-focus light-source with #2307 lamp and 8 foot Leads	8.50
PC-1L Photocell housing, 603AL plug-in Cell and 8 foot shielded cable	12.80
TPC-2L Tubular photocell housing with 603AL Cell and 8 foot shielded cable	12.00
AG-1 Armor-grip cable for tubular scanners only	3.50
SM-1 Swivel-mount assembly for tubular scanners only	3.50
MB-1 Mounting bracket for TR-1 series	0.35

SPARE PARTS

#12 bulb for LS-1C	\$ 0.20
#82 bulb for LS-4	.30
#210 bulb for LS-2C	.50
#2307 bulb for TLS-3	.65*
603AL photocell	3.75
T154X plug-in relay (TR-1 series)	5.00*
S2443 DPDT plug-in relay (TR-3, 4, and 5 series)	5.70*
17-007 short lensholder and hex nut for LS-1C ..	1.85
17-038 lensholder with hex nut for LS-2C	3.30
26-029 lensholder with hex nut for PC-1L	2.50
26-062 plug-in 6 digit counter for TR-1500	29.00*

*Net prices not subject to discount

PRICE LIST NO. 6 contains complete price information on all other FARMER ELECTRIC photoelectric scanner relays, assemblies, scanning heads, accessories, CK electronic timers, and Rototimers.

CATALOG A (32-pages) contains all technical details, specifications, dimensions, and photographs on all FARMER ELECTRIC products. Write or phone for your FREE copy today.

Prices are f.o.b. Natick, Mass.

Terms are 1% 10 days, net 30.

Prices are subject to change without notice

FARMER ELECTRIC PRODUCTS COMPANY, INC.

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